What is claimed is:

- 1 1. A photolithographic reduction projection catadioptric objective with a beam path,
 2 comprising: a first optical group (G1) including an even number of at least four mirrors
 3 (M1-M6); and a second at least substantially dioptric optical group (G2) more
 4 imageward than said first optical group including a number of lenses (E4-E13), and
 5 wherein said first optical group (GI) provides compensative axial colour correction for
 6 said second optical group (G2).
- The objective of Claim 1, wherein said image is formed with a numerical aperture of at least substantially 0.65.
- 1 3. The objective of Claim 1, said first optical group producing an intermediate virtual image (VF).
- The objective of Claim 1, wherein said at least four mirrors (M1-M6) of said first optical group (G1) include a convex mirror (M6) arranged most imageward in the beam path of the objective, and wherein said second optical group (G2) receives a beam from said convex mirror (M6).
- The objective of Claim 1, wherein optical surfaces of each minor MI-M6 of said objective are at least sections of surfaces of revolution each having a common axis (A) of symmetry.
- 1 6. The objective of Claim 1, wherein said second optical group is configured for independent compensative lateral aberrative correction.

- 7. A photolithographic reduction projection catadioptric objective, comprising: a first optical group (G1) including an even number of at least four mirrors (M1-M6) for producing a virtual intermediate image (VI); and a second at least substantially dioptric optical group (G2) more imageward than said first optical group (G1), said second optical group (G2) including a number of lenses (E4-E13) for receiving the virtual image (VI) and providing image reduction, and wherein said first optical group (G1) provides compensative axial colour correction for said second optical group (G2).
- 1 8. The objective of Claim 7, wherein said second optical group (G2) is configured for independent compensative lateral colour correction.
- 1 9. The objective of claim 1, wherein said image is formed with a numerical aperture of at least substantially 0.70.
- 1 10. The objective of claim 1, wherein said image is formed with a numerical aperture of at least substantially 0.75.
- 1 11. A photolithographic reduction projection catadioptric objective, comprising: a first 2 optical group (G1) including an even number of at least four mirrors (M1.M6) 3 including a convex most imageward mirror (M6), and a second at least substantially dioptric optical group (G2) more imageward than said first optical group (G1) receiving 4 5 a beam from the convex most imageward mirror (M6) of the first optical group (G1), 6 said second optical group (G2) including a number of lenses (E4-E13) providing image 7 reduction, and wherein said first optical group (G1) provides compensative axial colour 8 correction for said second optical group (G2).

- 1 12. The objective of Claim 9, wherein said second optical group (G2) is configured for independent compensative lateral color correction.
- 1 13. A photolithographic reduction projection catadioptric objective, comprising: a first
- optical group (G1) including an even number of at least six mirrors (M1-M6); and a
- 3 second at least substantially dioptric optical group more imageward than said first
- 4 optical group (G1) including a number of lenses (E4-E13) for providing image
- 5 reduction.
- 1 14. The objective of Claim 11, wherein said image is formed with a numerical aperture of
- 2 at least substantially 0.65.
- 1 15. The objective of Claim 11, said first optical group (G1) producing an intermediate
- 2 virtual image (VI).
- 1 16. The objective of Claim 11, wherein said at least six mirrors (M1-M6) of said first
- optical group (G1) include a convex most imageward mirror (M6), and wherein said
- 3 second optical group (G2) receives a beam from said convex most imageward mirror
- 4 (M6).
- 1 17. The objective of Claim 11, wherein optical surfaces of each mirror of said objective are
- at least sections of surfaces of revolution each having a common axis of symmetry (A).
- 1 18. The objective of Claim 11, wherein said second optical group (G2) is configured for
- 2 independent compensative lateral colour correction.

- 1 19. The objective of Claim 11, further comprising an unobscured system aperture (AS).
- 1 20. The objective of Claim 17, wherein said unobscured aperture AS is located within said
- 2 second optical group (G2).
- 1 21. The objective of Claim 11, further being devoid of any planar folding mirrors.
- 1 22. The objective of Claim 11, wherein an optical beam incident at said first optical group
- 2 (G1) is divergent after a most imageward mirror (M6) of said first optical group (G1).
- 1 23. The objective of Claim 11, which is further an unobscured system comprising parallel
- 2 axes (A) of symmetry of curvatures of each optical element (M1-M6, E1-E13) of said
- first (G1) and second optical groups (G2), and wherein no more than three (M3, M4,
- 4 M5) of said optical elements are cut to deviate in a substantially non-rotationally
- 5 symmetric form.
- 1 24. The objective of Claim 11, comprising in sequence, in an optical direction form an
- 2 object (Ob) side of said objective before said first optical group (G1) to an image (Im)
- 3 side of said objective after said second optical group (G2), a first catadioptric sub group
- 4 (E1-M4) for producing a real intermediate image (IMI), a second sub group (M5, M6)
- 5 including catoptric components for producing a virtual image (VI), and said second at
- 6 least substantially dioptric group (G2) for producing a real image.
- 1 25. The objective of Claim 11, comprising in sequence, in an optical direction from an
- 2 object side of said objective before said first optical group (G1) to an image (Im) side of
- said objective after said second optical group (G2), a first field lens sub group (E1), a

- second catadioptric sub group comprising one or more negative lenses (E2, E3) and a
- 5 concave mirror (M2), generating axial chromatic aberration, a third sub group
- 6 including an odd number of catoptric components (M4, M5, M6), and a fourth positive
- 7 lens group (G2).
- 1 26. The objective of Claim 11, wherein said second optical group (G2) comprises a
- 2 plurality of lenses (E4-E13), wherein a diameter of a beam incident upon each of said
- plurality of lenses is at least half of a diameter of said each lens (E4-E13).
- 1 27. The objective of Claim 11, wherein said objective is doubly telecentric.
- 1 28. The objective of Claim 11, wherein optical paths of projected rays are redirected at
- each lens element (E4-E13) of said second optical group at an angle of less than
- 3 substantially 20°.
- 1 29. The objective of Claim 11, wherein said image is formed with a numerical aperture of
- 2 at least substantially 0.70.
- 1 30. The objective of Claims 11, wherein said image is formed with a numerical aperture of
- at least substantially 0.75.